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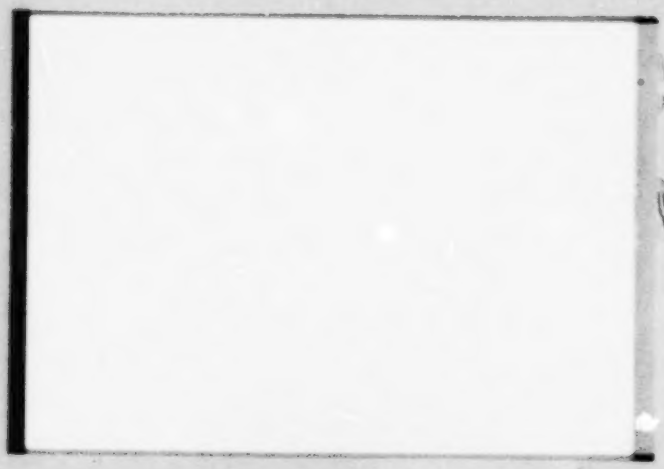

ACCESSIBILITY COSTS FOR HOUSING

Prepared for
CANADA MORTGAGE AND HOUSING CORPORATION
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Canada Mortgage and Housing Corporation, the Federal Government's housing agency, is responsible for administering the National Housing Act.

This legislation is designed to aid in the improvement of housing and living conditions in Canada. As a result, the Corporation has interests in all aspects of housing and urban growth and development.

Under Part V of this Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research. CMHC therefore has a statutory responsibility to make widely available, information which may be useful in the improvement of housing and living conditions.

This publication is one of the many items of information published by CMHC with the assistance of federal funds.

FOREWORD

As part of the ongoing research activity in the housing needs of disabled persons, Canada Mortgage and Housing Corporation commissioned Falta & Associés, experts-conseils, to prepare this report. The analyses presented herein are the personal views of the author, and no responsability for them should be attributed to the Corporation.

The author wishes to acknowledge the important contribution of Carol Kushner, research consultant, in distilling the research results for presentation in this report. Equally important was the data supplied by Jan F. Valasek, architect-engineer, for the cost analysis and illustrations. The author would also like to recognize the support provided by CMHC advisory committee, comprised by Michael Pine, senior development analyst, Research & Development Sector and Frederick Plimmer, project manager, Cost Benefit Analysis.

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1.0 INTRODUCTION

At present, much of the resistance to making all or most housing basically accessible to disabled persons - particularly those in wheelchairs - hinges on two factors: a lack of know-how and a tendency to overestimate the complexities and costs of what is essentially a simple, inexpensive, straight-forward undertaking. The objective of presenting the following information is to encourage architects, developers and contractors to reassess their stance on barrier-free access, and to better understand its implications.

This report has been commissioned by Canada Mortgage and Housing Corporation to identify additional costs associated with producing housing which is free of barriers to disabled persons. The study specifies the nature and cost of those design features which promote universal accessibility in a variety of housing types intended to apply equally to family, singles/couples and senior citizens' accommodation.

The information presents the opinions of the consultants, and attempts to take a realistic approach to the subject of housing accessibility. It takes into account the requirements for barrier-free access which will become mandatory in the 1985 National Building Code, Sections 3.7. 9.6.3, 9.8.6 and 9.9.2. It also goes beyond these requirements in making suggestions where low-rise housing types (exempted in the 1985 NBC) could be made accessible to some "reasonable" extent in order that the stock of barrier-free housing be increased.

The approach taken to determine the barrier-free design features is based on the needs of the wheelchair user. For people who require the continual use of a wheelchair, the physical environment presents the greatest number of barriers in terms of both operational and architectural access because of its size, wheels, and the limited range of a seated person.

The very fact of rendering a building accessible to wheelchair users offers spin-off benefits to other residents and visitors: to all children, elderly persons with or without mobility aids, all temporarily disabled persons, and people who use strollers, bundle buggies or equipment dollies. Various aspects of what constitutes barrier-free access are equally appreciated by able-bodied residents, and therefore buildings which are accessible are appreciated for heightened tenant value.

The bulk of the information is presented in a series of cost analysis tables which relate to new construction. Mention is also made of improving access in existing buildings, where sections of the tables may also be applicable, but where actual costs are impossible to predict.

The results of the cost analysis tables verify that the majority of features that enhance universal accessibility can be incorporated at no or minimal additional cost. In the context of total construction costs, whether for new buildings or major renovations, even those features which imply additional cost only amount to a fractional percentage of the total outlay. These facts should encourage architects, developers and contractors to actively seek out opportunities to render housing accessible, in order to provide disabled persons with a choice of housing at a variety of costs and rents, and thus to integrate them fully into the community.

Since 1981, the International Year of Disabled Persons, there has been an increased attention given to the housing needs of the disabled population. It is recognized that they as individuals aspire to the same choices as able-bodied people have in selecting their housing and they, in the same way, need it to respond to differing life-styles, family sizes, household roles and financial capabilities. Since there is a growing number of disabled persons integrated in society, there is an increasing need to offer a wider selection of housing types to this clientelle. Barrier-free access has to be given some consideration in all housing.

2.0 LEVELS OF BARRIER-FREE ACCESS

While recognizing that wheelchair users have differing needs depending on age, attitudes, physical capabilities, etc., this report focuses only on removing the obstacles which all wheelchair users have in common. Many adaptations that are specific to one individual's needs may be superfluous to another's. For example, an adapted kitchen would not be necessary for a disabled child, since parents would do most of the cooking. The installation of grab-bars is completely impractical for a disabled person who has no use whatsoever of arms and hands.

The extent of adaptations perceived to be necessary in any one situation very much depends on the individual: some people require much more than others. Many prefer less modifications than more. For these reasons, adaptations which are specific to an individual's capacities and needs are considered to be outside the scope of universal accessibility and therefore beyond the objectives of this report. A list of resource reading and reference for specific adaptations is given in section 5.0.

In addressing the question of removing general barriers to wheelchair users, this report deals with two levels of access, "essential" and "desirable", which are used in the cost analysis.

2.1 ESSENTIAL ACCESSIBILITY is oriented to removing the most basic barriers so as to insure a reasonable level of universal access in much of our housing. The design-related features provide access without obstacles from a street or parking space to a building via a primary pedestrian route and main entrance. Access throughout the public spaces of the building, corridors and doors, to all floors in elevator buildings, as well as within the dwelling units, should also be ensured.

This level of access goes somewhat beyond what is mandatory in the 1985 National Building Code, but in the opinion of the consultant, the "essential" features identified are often already provided in new housing, and are recognized for improving its quality and attractiveness. They are necessary to accommodate visitors and residents in a wheelchair, so that they can move and manouver with reasonable independence. Though it does not preclude that some aid may have to be offered by another person (e.g. open a door, push a button), it does mean that any person in a wheelchair can enter and use a building just the same as an able-bodied person, can use a public toilet if one is provided, and within the units can enter a bathroom and approach the toilet.

2.2 DESIRABLE ACCESSIBILITY offers a greater degree of autonomy and facility of use for disabled persons, allowing them an increased opportunity to function within the building and dwelling unit, not only as visitors but also as independent residents. It must be acknowledged that disabled persons (with all the varieties and ranges of impairements) are used to living in a world imperfectly suited to their particular problems. Nevertheless, they have learned to adapt and cope adequately in the environment, provided that major obstacles, labelled "essential" above, are removed. Therefore, "desirable" features are those that will enhance their security and autonomy of action, beyond the most basic level.

3.0 NEW HOUSING

In new housing, it is a straightforward matter to provide barrier-free access, since the required elements can be incorporated at the planning stage with minimal modifications to design and specifications. This means that providing universally accessible housing in new construction, particularly in some building types, can be accomplished with little effort and minimal expense.

In dealing with the design and cost implications of architectural accessibility, the following housing types are treated independently, although in each housing type, many of the features are repeated.

3.1 MULTI-TENANCY BUILDINGS WITH ELEVATOR

3.2 MULTI-TENANCY WALK-UP BUILDINGS

3.3 DUPLEX/TRIPLEX DWELLINGS

3.4 SINGLE FAMILY DWELLINGS (TWO STOREY/SPLIT LEVEL)

3.5 SINGLE FAMILY DWELLINGS (SINGLE STOREY)

According to the 1985 NBC, only the first category - multi-tenancy buildings with elevator - will have to be accessible, and only those multi-tenancy walk-up buildings whose ground floor is close to grade will have to be accessible on that level. However, accessibility in housing should go beyond these limits and encompass some considerations of barrier-free access in all housing types.

The NBC also makes provision for evacuation of disabled persons in a fire emergency by mandating that non-sprinklered buildings have at least one elevator for use by fire-figthers, that the floor area be divided into two zones, and that balconies be accessible.

For each housing type, accessibility design features have been identified as being either ESSENTIAL or DESIRABLE. Under these categories they are distinguished as having either "no or minimal cost" (written as NO COST in the following tables), or as having an "additional cost" (ADD. COST in the tables) which is provided.

Where it has been stated that "no or minimal cost" is associated with the design requirements, this implies that the cost is negligable or impossible to extrapolate (e.g. controls placed lower or lever handles substituted for round knobs). Case studies that have tried to evaluate these costs have been unable to isolate and quantify them.

Some of the features identified as either "essential" or "desirable" are provided as a matter of course in some types of housing, and consequently they are not considered to constitute additional cost (e.g. sheltered entranceways are common in high-rise apartment buildings).

Where a design feature has been identified as carrying "additional cost", the cost figure has been derived from current 1982 market prices in the Toronto area. To arrive at a regionally adjusted figure, these costs should be adjusted according to the Cost Variation Index provided in the Appendix.

The area dimensions given in the tables are considered for barrier-free access, and do not necessarily correspond to guidelines suggested in CMHC's Housing Disabled Persons, 1982, since the housing addressed in the present report is not specifically designed for disabled persons. In cases where alternate design solutions are identified for one accessibility requirement, the alternatives are separated by an OR phrase. For purposes of clarity, illustrations of many of the design features are provided in the Appendix. A glossary of terms is also included.

3.1 MULTI-TENANCY BUILDINGS WITH ELEVATOR

Since elevator-equipped buildings already have an accessible vertical circulation system, there is no reason why they could not all be made fully accessible - at the entry, throughout the public areas and common services, and within the units. The larger the building, the more important that it be accessible, since the greater the number of units per building, the greater the possibility that persons in wheelchairs will visit or live there. This fact, however, does not preclude the necessity that other types of housing stock be also accessible.

All of the units in elevator-equipped buildings should be equally accessible, because all of them (irrespective of their size or location) should be able to receive persons in a wheelchair - with wide enough doorways, circulation areas and bathroom access.

3.1.1 SITE ACCESS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
curb cuts in sidewalk and pedestrian access routes				
: min. 900 mm wide, slope 1:8 max. (fig. 1)	●			
: 1500 mm wide recommended			●	
access routes from street, parking, etc.				
: no steps	●			
: hard-surfaced	●			
outside parking for visitors and residents (fig. 2) (1 accessible space per 20 dwellings units), up to a maximum of 4)				
: space 3.7 m wide to get in/out of car		60		

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
garage parking - 1 accessible space per 20 dwellings, up to a maximum of 4 (cost has been derived by expanding the dimension of a standard 3 m x 6 m space)				
: at or above grade level, space 3.7 m wide to get in/out of car				900
: below grade level, space 3.7 m wide to get in/out of car				1500
3.1.2 ACCESS INTO BUILDING				
main entrance				
: level landing in front of door (fig. 5) 1.5 m X 1.5 m	●			
: sheltered (recessed entry, canopy, etc.)	●			
: grade level without steps	●			
OR				
: ramp, where no grade level entry (fig. 3) 3.6 m long for 300 mm of rise, width 900 mm, handrails on both sides - (cost for 3.6 m of ramp, in concrete)		2200		
doors : clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
: max. push/pull on door 38 N			●	
OR				
: special closer to lighten door pressure				900
vestibule (fig. 4)				
: 1.8 m between successive doors	●			
: post boxes not higher than 1.4 m	●			
: intercom 1.2 m high with all controls reachable from a sitting position	●			

3.1.3 ACCESS WITHIN BUILDING

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
elevator				
: large enough for wheelchair (min. 1.2 m X 1.5 m)	●			
: top of control panel in cabin max. 1.4 m high	●			
: large raised numbers on control panel			●	
common services				
: all areas accessible without steps (elevator, laundry, public washrooms, management office, outdoor living space, garbage, mail, party room, exercise room, etc.)	●			
: garbage chute max. height 900 mm			●	
all doors				
: clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
: max. push/pull on door 22 N			●	
public washrooms (fig. 6)				
: clear floor space 1.5 m diameter	●			
: door swing not to obstruct access to fixtures (preferably open to outside)	●			
: kneespace under washbasin			●	
: lever faucets at washbasin			●	
: grab bar 600 mm long installed at side of toilet				40
signage				
: large, well-lit lettering to identify common services and dwelling units	●			

3.1.4 ACCESS WITHIN DWELLING UNITS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
corridors (fig. 7)				
: min. 1.0 m wide	●			
: area at entrance door min. 1.35 m wide (space at handle side of door 450 mm wide				240
all doors				
: clear opening min. 760 mm (thresholds not higher than 13 mm)	●			
: lever handles instead of round door knobs			●	
entry to outdoor living area (patio) or balcony				
: threshold not higher than 50 mm			●	
window sills in habitable rooms				
: max. height 800 mm	●			
bathroom (fig. 8)				
: door swing not to obstruct access to fixtures	●			
: lower edge of mirror 1 m high	●			
: lever faucets at washbasin and tub/ shower			●	
: minimum area 1.65 m X 2.4 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of a 1.5 m X 2.1 m bathroom)		360		
: plywood reinforcing around tub and at side of toilet for installation of grab-bars when required				50

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
controls				
: light switches 1.2 m high	●			
: electric outlets 450 mm high	●			
: intercom 1.2 m high	●			
: thermostat 1.2 m high	●			
: fuse box (load center) 1.2 m high	●			
closet rods/shelves: 1.5 m high				
kitchen (fig. 10)				
: upper cabinets 400 mm above counter	●			
: vertical accessible storage		80		
: pull-out cutting board			●	
: "D" handles on cabinet doors and drawers			●	
: lever faucets at sink			●	

3.2 MULTI-TENANCY WALK-UP BUILDINGS

The buildings should be accessible and useable by disabled persons on the ground floor. This includes entry, public areas, basic services as well as dwelling units. Where communal spaces such as activity rooms, etc., are provided, they should preferably be made accessible.

3.2.1 SITE ACCESS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
curb cuts in sidewalk/pedestrian access routes				
: min. 900 mm wide, slope 1:8 max. (fig. 1)	●			
: 1500 mm wide recommended			●	
access routes from street, parking, etc.				
: no steps	●			
: hard-surfaced	●			
outside parking for visitors and residents (fig. 2) (1 accessible space per 20 dwellings)				
: space 3.7 m wide to get in/out of car	●			
garage parking at grade (1 accessible space per 20 dwellings)				
: space 3.7 m wide to get in/out or car				900
patio : hard-surfaced	●			

3.2.2 ACCESS INTO BUILDING

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
main entrance (fig. 5)				
: level landing in front of door 1.5 m X 1.5 m	●			
: sheltered (roof, canopy, awning, etc.)			●	
: grade level without steps	●			
OR				
: ramp where no grade level entry (fig. 3) 3.6 m long for 300 mm of rise, width 900 mm, handrails on both sides -				
(cost for 3.6 m of ramp, in concrete)		2200		
(cost for 3.6 m of ramp, in wood)		900		
doors				
: clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
: max. push/pull on door 38 N			●	
OR				
: special closer to lighten door pressure				900
vestibule (fig. 4)				
: 1.8 m between successive doors	●			
: post boxes not higher than 1.4 m average	●			
: intercom 1.2 m high with all controls reachable from a sitting position	●			

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
3.2.3 ACCESS WITHIN BUILDING				
common services				
: basic services accessible without steps - laundry, public washroom, mail, garbage, outdoor living space, management	●			
: garbage chute max. height 900 mm			●	
all doors				
: clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
: max. push/pull on door 22 N			●	
public washrooms (fig. 6)				
: clear floor space 1.5 m diameter	●			
: door swing not to obstruct access to fixtures (preferably open to outside)	●			
: kneespace under washbasin			●	
: lever faucets at washbasin			●	
: grab bar 600 mm long installed at side of toilet				40
signage				
: large, well-lit lettering to identify common services and dwelling units	●			
3.2.4 ACCESS WITHIN GROUND LEVEL DWELLING UNITS				
corridors (fig. 7)				
: min. 1.0 m wide	●			
: area at entrance door min. 1.35 m wide (space at handle side of door 450 mm wide)				240

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
all doors				
: clear opening min. 760 mm (thresholds not higher than 13 mm)	●			
: lever handles instead of round door knobs			●	
entry to outdoor living area (patio) or balcony				
: threshold not higher than 50 mm			●	
window sills in habitable rooms				
: max. height 800 mm	●			
bathroom (fig. 8)				
: door swing not to obstruct access to fixtures	●			
: lower edge of mirror 1 m high	●			
: lever faucets at washbasin and tub/shower			●	
: minimum area 1.65 m X 2.4 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of 1.5 m X 2.1 m bathroom)		360		
: plywood reinforcing around tub and at side or toilet for installation of grab-bars when required				50
controls				
: light switches 1.2 m high	●			
: electric outlets 450 mm high	●			
: intercom 1.2 m high	●			
: thermostat 1.2 m high	●			
: fuse box (load center) 1.2 m high	●			
closet rods/shelves				
: 1.5 m high	●			

kitchen (fig. 10)

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
: upper cabinets 400 mm above counter	●			
: vertical accessible storage		80		
: pull-out cutting board			●	
: "D" handles on cabinet doors and drawers			●	
: lever faucets at sink			●	

3.3 DUPLEX / TRIPLEX WALK-UP BUILDINGS

Only dwelling units on the ground level are suggestedto be independently accessible to disabled persons, since grade level entry can be easily provided. (The NBC excludes these from mandatory accessibility.)

3.3.1 SITE ACCESS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
pedestrian access routes from street, parking etc.				
: no steps	●			
: hard-surfaced	●			
outside parking (fig. 2)				
: space 3.7 m wide to get in/out of car	●			
garage parking				
: space 3.7 m wide to get in/out of car (the cost has been derived by expanding the dimensions of a 3 m X 6 m space)				1200
patio : hard-surfaced			●	

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
3.3.2 ACCESS TO GROUND LEVEL DWELLING UNIT				
entrance (fig. 5)				
: level landing in front of door 1.5 m X 1.5 m	●			
: sheltered (roof, canopy, awning, etc.)			●	
: grade level without steps			●	
OR				
: ramp where no grade level entry 3.6 m long for 300 mm rise, width 900 mm				600
(cost for 3.6 m ramp, in wood)				400
doors : clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
3.3.3 ACCESS WITHIN GROUND LEVEL BUILDING UNIT				
corridors (fig. 7)				
: min. 1.0 m wide	●			
: area at entrance door min. 1.35 mm wide (space at handle side of door 450 mm wide)				240
all doors				
: clear opening min. 760 mm (thresholds not higher than 13 mm)	●			
: lever handles instead of round door knobs			●	
entry to outdoor living area (patio)				
: threshold not higher than 50 mm			●	

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
window sills in habitable rooms				
: max. height 800 mm	●			
bathroom (fig. 8)				
: door swing not to obstruct access to fixtures	●			
: lower edge of mirror 1 m high	●			
: lever faucets at washbasin and tub/shower			●	
: minimum area 1.65 m X 2.4 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of a 1.5 m X 2.1 m bathroom)		360		
: plywood reinforcing around tub and at side of toilet for installation of grab-bars when required				50
controls				
: light switches 1.2 m high	●			
: electric outlets 450 mm high	●			
: intercom 1.2 m high	●			
: thermostat 1.2 m high	●			
: fuse box (load center) 1.2 m high	●			
closet rods/shelves				
: 1.5 m high	●			
kitchen (fig. 10)				
: upper cabinets 400 mm above counter	●			
: vertical accessible storage	●			
: pull-out cutting board			●	
: "D" handles on cabinet doors and drawers			●	
: lever faucets at sink			●	

3.4 SINGLE FAMILY DWELLINGS (TWO-STOREY/SPLIT-LEVEL)

It may be possible to make this type of housing partially accessible by ensuring access to the ground floor. The further provision of an accessible bathroom/powder room and even a bedroom on this level could accommodate a disabled visitor or resident. Access to other levels of the house is not expected.

3.4.1 SITE ACCESS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
pedestrian access routes from street, parking, etc.				
: no steps	●			
: hard-surfaced	●			
outside parking				
: space 3.7 m wide to get in/out of car			●	
garage parking				
: space 3.7 m wide to get in/out of car (the cost has been derived by expanding the dimensions of a standard 3 m X 6 m space)				1200
patio: hard-surfaced	●			

3.4.2 ACCESS TO DWELLING	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
entrance (fig. 5)				
: level landing in front of door 1.5 m X 1.5 m	●			
: sheltered (roof, canopy, awning, etc.)			●	
: grade level without steps			●	
doors: clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
3.4.3 ACCESS ON THE GROUND LEVEL				
corridors (fig. 7)				
: min. 1.0 m wide	●			
: area at entrance door min. 1.35 m wide (space at handle side of door 450 mm wide)				240
all doors				
: clear opening min. 760 mm (thresholds not higher than 13 mm)	●			
: lever handles instead of round door knobs			●	
access without steps to indoor living area			●	
entry to outdoor living area (patio)				
: threshold not higher than 50 mm			●	
window sills in habitable rooms				
: max. height 800 mm	●			

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
powder room or bathroom at ground level (fig 8 & 9)				
: door swing not to obstruct access to fixtures	●			
: lower edge of mirror 1 m high	●			
: lever faucets at washbasin and tub/shower			●	
: powder room minimum area 1.35 m X 1.65 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of a 1.05 m X 1.5 m powder room)		290		
OR				
: bathroom minimum area 1.65 m X 2.4 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of a 1.5 m X 2.1 m bathroom)		360		
controls				
: light switches 1.2 m high	●			
: electric outlets 450 mm high	●			
: thermostat 1.2 m high	●			
: fuse box (load center) 1.2 m high	●			
closet rods/shelves: 1.5 m high	●			
kitchen (fig. 10)				
: upper cabinets 400 mm above counter	●			
: vertical accessible storage		80		
: pull-out cutting board			●	
: "D" handles on cabinet doors and drawers			●	
: lever faucets at sink			●	

3.5 SINGLE FAMILY DWELLING (SINGLE-STOREY)

The bungalow/ranchouse is the easiest single-family housing type to render accessible to disabled persons, since all the major living and sleeping areas are located on one level, and the entry can be designed at or near grade.

3.5.1 SITE ACCESS

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
pedestrian access routes from street, parking, etc.				
: no steps	●			
: hard-surfaced	●			
outside parking				
: space 3.7 m wide to get in/out of car			●	
garage parking				
: space 3.7 m wide to get in/out of car (the cost has been derived by expanding the dimensions of a standard 3 m X 6 m space)				1200
patio: hard-surfaced	●			

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
3.5.2 ACCESS TO DWELLING				
entrance (fig. 5)				
: level landing in front of door 1.5 m X 1.5 m	●			
: sheltered (roof, canopy, awning, etc.)			●	
: grade level without steps			●	
doors				
: clear opening min. 800 mm (thresholds not higher than 13 mm)	●			
: pull or lever handles			●	
3.5.3 ACCESS WITHIN DWELLING				
corridors (fig. 7)				
: min. 1.0 m wide	●			
: area at entrance door min. 1.35 m wide (space at handle side of door 450 mm wide)				240
all doors				
: clear opening min. 760 mm (thresholds not higher than 13 mm)	●			
: lever handles instead of round door knobs			●	
access without steps to indoor living area	●			
entry to outdoor living area (patio)				
: threshold not higher than 50 mm			●	
window sills in habitable rooms				
: max. height 800 mm	●			

	ESSENTIAL		DESIRABLE	
	No Cost	Add. Cost $	No Cost	Add. Cost $
bathroom (one per dwelling) (fig. 8)				
: door swing not to obstruct access to fixtures	●			
: lower edge of mirror 1 m high	●			
: lever faucets at washbasin and tub/shower			●	
: minimum area 1.65 m X 2.4 m to allow space for manouvering wheelchair (the cost has been derived by expanding the dimensions of a 1.5 m X 2.1 m bathroom)		360		
controls				
: light switches 1.2 m high	●			
: electric outlets 450 mm	●			
: thermostat 1.2 m high	●			
: fuse box (load center) 1.2 m high	●			
closet rods/shelves: 1.5 m high	●			
kitchen (fig. 10)				
: upper cabinets 400 mm above counter	●			
: vertical accessible storage		80		
: pull-out cutting board			●	
: "D" handles on cabinet doors and drawers			●	
: lever faucets at sink			●	

4.0 EXISTING HOUSING

Satisfying the requirements for basic accessibility is neither difficult, specialized, nor costly in new construction since the design features can be incorporated from the outset. Trying to achieve basic accessibility in an existing building, on the other hand, can be a more involved proposition, since relatively insignificant design changes may require a fair amount of construction work. Enlarging a door by 100 mm, moving a wall by 150 mm, lowering controls, windows etc. are all expensive retrofit modifications which ought to be undertaken only under certain conditions.

There are two distinct situations where it may be necessary, or feasible, to modify housing for accessibility. The first occurs when a disabled person requires alterations in the home to suit individual needs for access and function. Because such modifications are both user-specific and building-specific, they fall outside the definition of universal accessibility, and therefore are not dealt with in this report.

The second situation occurs where either conversion, renovation or rehabilitation of existing housing is undertaken on a broad scale. Accessibility features can often be incorporated into such work. However, each building needs to be evaluated for its own potential for access, and some buildings lend themselves surprisingly well for such provisions. Not all, however, and depending upon the context, the design solutions to create accessibility may be simple or complicated. Therefore construction costs may vary widely, are impossible to predict, and under certain conditions may be difficult to isolate from the cost of other ongoing work. Nevertheless, for certain features the cost analysis tables prepared in Section 3.0 relating to new construction may be useful as guidelines.

CONVERSION, RENOVATION , REHABILITATION

Because conversion means a complete change of use of an existing building (for example, transforming an unused school into housing units), it is accompanied by major design and construction changes. Here the opportunities for incorporating accessibility features are just a great as in new construction, and sometimes even more advantageous, since in existing construction total cost per square meter is often not a predominant factor.

A similar opportunity may be present in renovation or rehabilitation, depending on the extent of work undertaken. It is surprising how sometimes buildings conform closely to access requirements, needing only minor intervention to make them useable by disabled persons. For instance, the ground level unit in a triplex may have good potential. Sometimes a ramp at the entrance is all that is required to achieve a reasonable level of accessibility. Older buildings with elevators are especially good candidates for accessibility, since the size of the building and the number of units served would increase the cost effectiveness of the modifications.

While it is not reasonable to insist that accessibility features be incorporated in every renovation or rehabilitation, wherever any access-related elements such as doors, or bathrooms, are slated for renovation, they should follow accessibility standards, as mandated in the National Building Code, and/or provincial and municipal codes, and following the suggestions made in this and similar publications, so that barrier-free design eventually becomes the normal approach to building, not the exception.

5.0 RESOURCE READING

5.1 UNIVERSAL ACCESSIBILITY

Accessible Housing Bulletin / Accessibilité à l'habitation,
Vol. 1, 1982: "Making housing more accessible to more Canadians",
Vol. 2, 1982: "Setting your 'sites' on good access",
Vol. 3, 1983: "'Inside' information on good access".

Available from: Canadian Housing Design Council, M-2
1'Esplanade Laurier, 171 Bank Street, Ottawa, Ont. K2P 1W5.

Housing Adaptability Guidelines, A concept to make all housing accessible, 1980. Available from: Peoples Center for Housing Change, 1424 Old Topanga Canyon Road, Topanga, Calif. 90290.

Accessible Housing, A Manual on North Carolina's Building Code Requirements for Accessible Housing, 1980. Available from: The Special Office for the Handicapped, North Carolina Department of Insurance, P.O. Box 26387, Raleigh, N.C. 27611.

The Estimated Cost of Accessible Buildings, and
A Cost-Benefit Analysis of Accessibility, U.S. Department of Housing and Urban Development, Office of Policy Development and Research, 1979. Available from: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

The Cost of Accessibility in New Single-Family Homes, Minnesota Housing Finance Agency, 1982.

Accessible Residential Communities: Issues and Solutions, Associated Planning Consultants Inc., Toronto, 1982. Available from: Canada Mortgage and Housing Corporation, Policy Evaluation Division, Ottawa, K1A 0P7.

La marche vers l'accessibilité, Rapport sur l'accessibilité des immeubles aux personnes handicapées, 1980. Available from: Office des personnes handicapées du Québec, 309, rue Brock, Drummondville, QC, J2B 1C5.

5.2 ADAPTED HOUSING FOR DISABLED PERSONS

Housing Disabled Persons, Canada Mortgage and Housing Corporation, NHA 5468, 1982. Available from: Publications Division, CMHC, National Office, Montreal Road, Ottawa, Ont. K1A 0P7.

Making your Home Accessible: A disabled Consumer's Guide/ Comment rendre votre logement accessible: guide du consommateur handicapé, Canadian Housing Design Council, 1983. Available from: Communications Service, Consumer and Corporate Affairs Canada, Ottawa, Ont. K1A 0C9.

The Accessible Home: Renovating for your disabled child, Heather Snell, 1983. Available from: IS FIVE PRESS, 467 Richmond Street East, Toronto, Ont. M5A 1R1.

L'accessibilité à domicile: Guide d'évaluation des domiciles existants et de réalisations des réaménagements. Available from: Office des personnes handicapées du Québec, 309, rue Brock, Drummondville, QC, J2B 1C5.

Cost and Design of Housing for Disabled Persons - Case Studies, Associated Planning Consultants Inc., Toronto, 1982. Available from: Canada Mortgage and Housing Corporation, Policy Evaluation Division, Ottawa, K1A 0P7

APPENDIX

GLOSSARY OF TERMS

adapted dwelling: a dwelling unit with special modifications to some interior features to facilitate use by a resident in a wheelchair.

conversion: complete change of use of an existing building, accompanied by major design and construction changes.

curb: a low structure which defines and retains the edge of a roadway, walk or other area.

design feature: an element of the built environment identified, quantified and specified.

grade level entry: having direct access without steps from the ground to the building or dwelling.

habitable room: all rooms or spaces intended for human occupancy in a dwelling.

outdoor living area: an outside space immediately adjacent to and accessible from a dwelling or common social space and capable of accommodating a variety of individual outdoor activities for the residents, e.g., patio, balcony, terrace, etc.

ramp: a sloping surface which provides a pedestrian or vehicular connection between two levels.

rehabilitation: alterations and repairs made to existing buildings to bring it to acceptable contemporary standards.

renovation: major tearing down and functional updating, where various elements of an existing building are upgraded or replaced.

special closer to lighten door pressure: an electric device which is activated by a button at the side of a door to release the mechanical door closer for a specified period of time.

ILLUSTRATIONS:

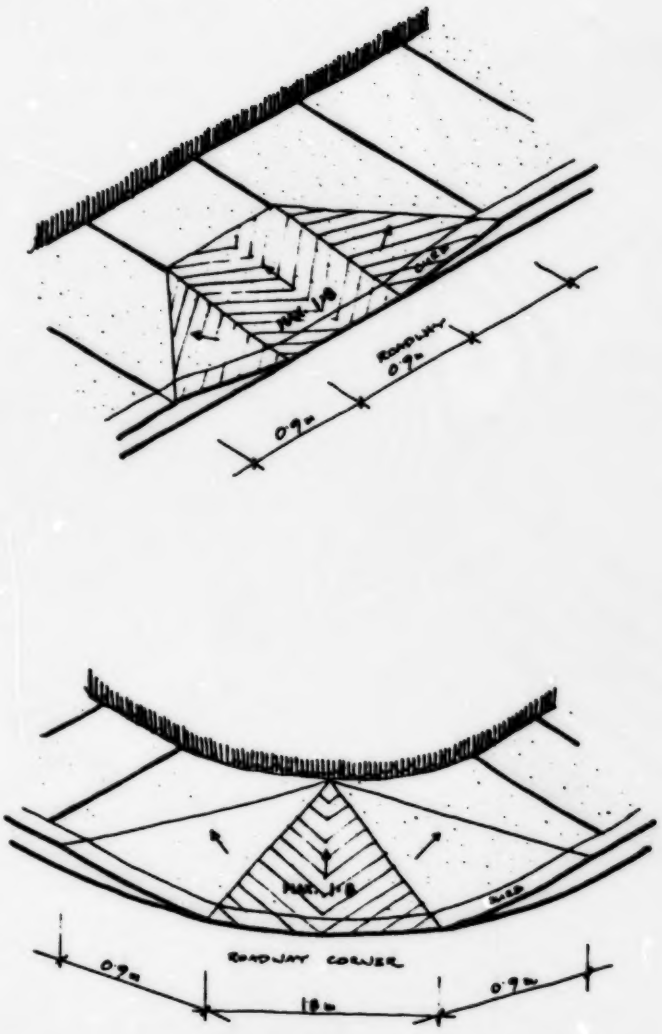

Figure 1:
curb cuts in sidewalk and pedestrian access routes

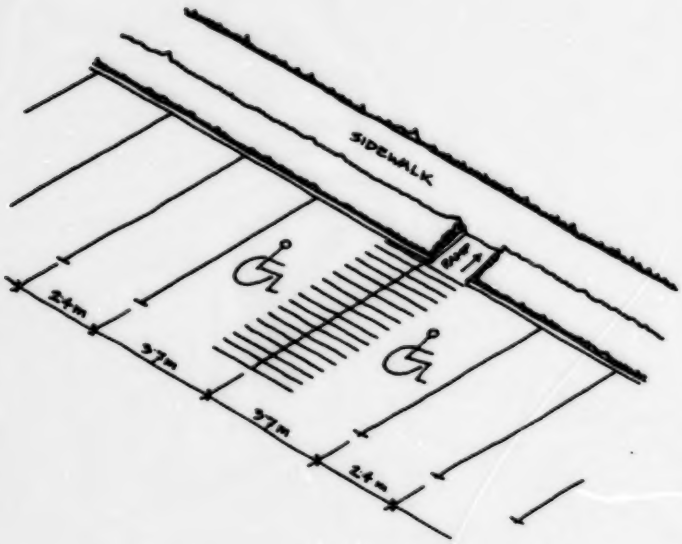

Figure 2:
outside parking
with curb cut

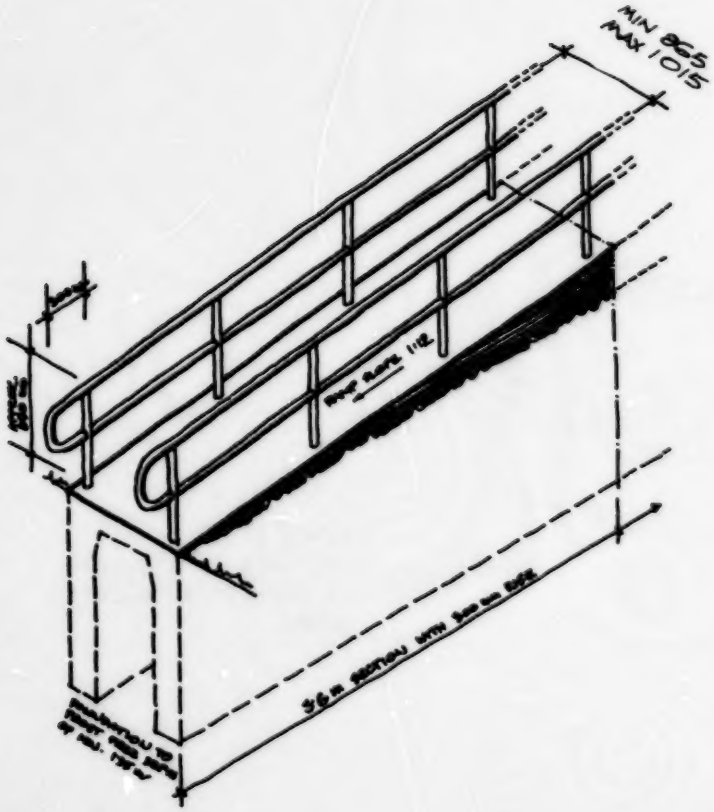

Figure 3:
concrete ramp

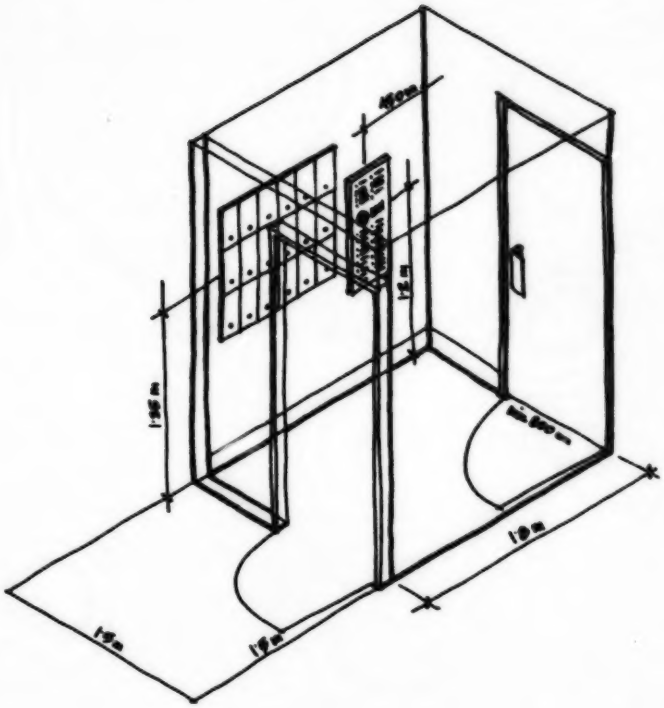

Figure 4:
vestibule in multi-tenancy building

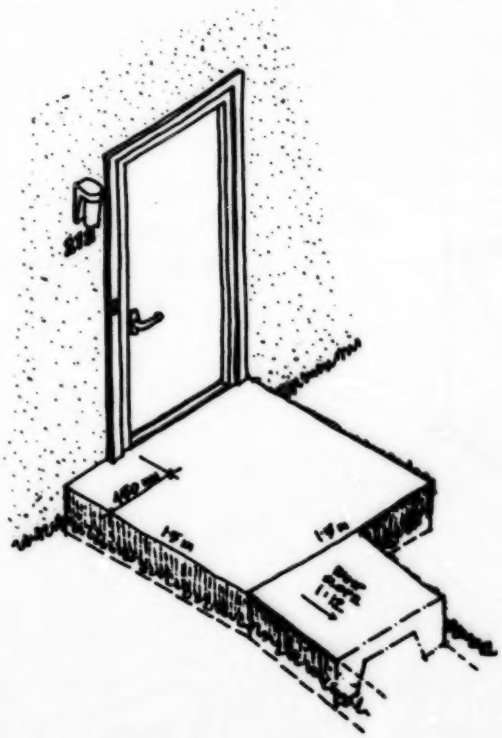

Figure 5:
main entrance at grade

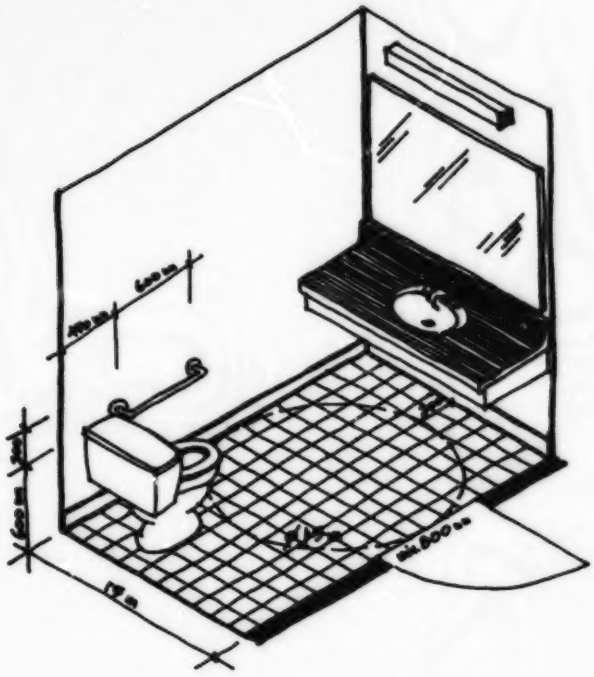

Figure 6:
public washroom

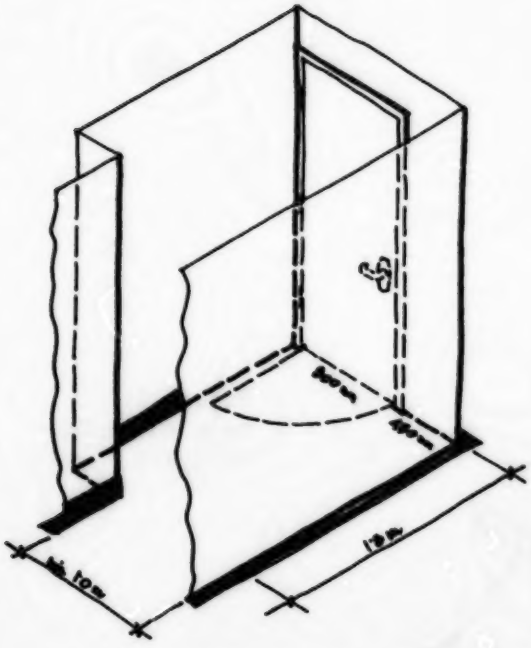

Figure 7:
area at entrance door

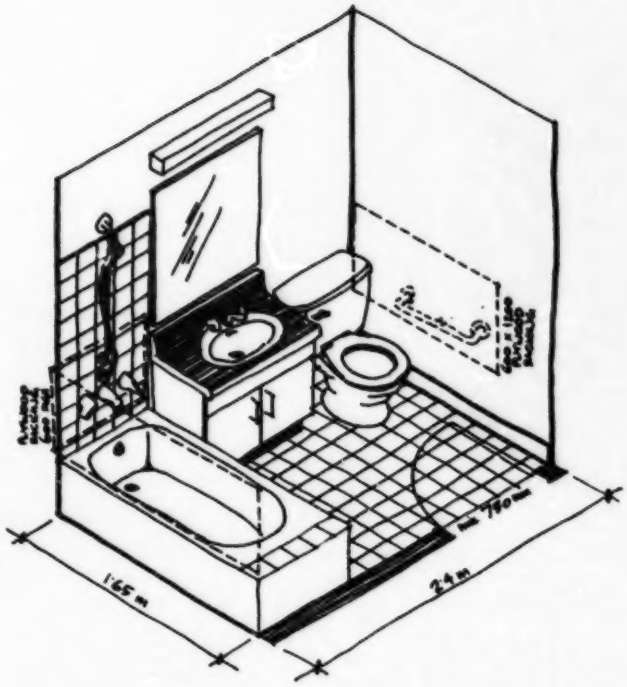

Figure 8:
bathroom

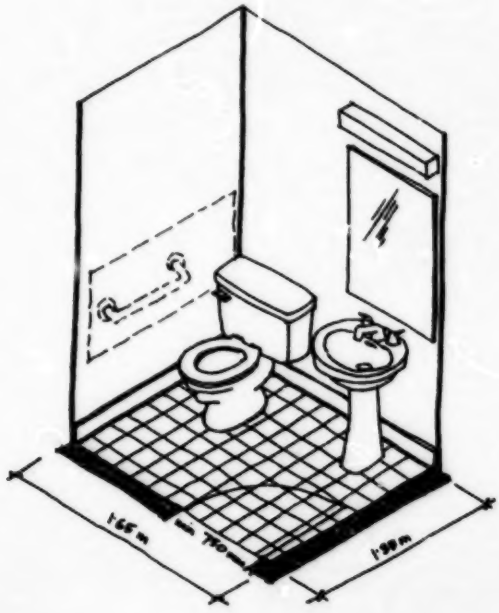

Figure 9:
powder room

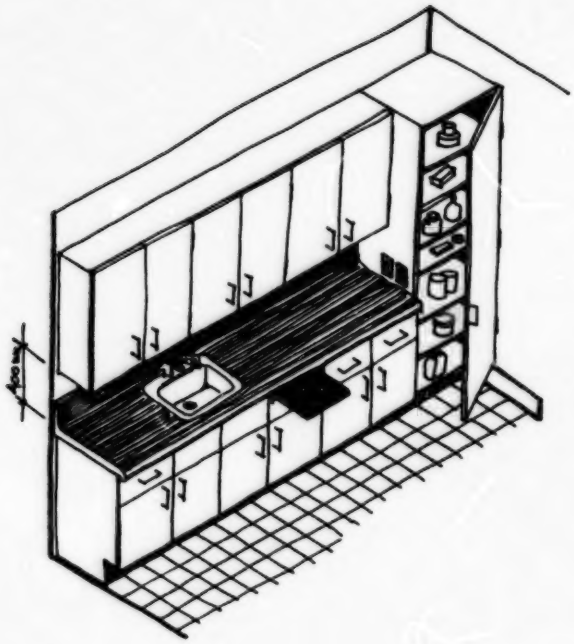

Figure 10:
kitchen storage and
pull-out work board

COST VARIATION INDEX

The costs for new building work are average rates for reasonable quantities of work and comprise base labour rates plus benefits, material costs plus handling, waste, federal and provincial taxes, and small plant and hand tool costs. No allowance has been made for general contractors' site expenses, overhead and profit.

The rates quoted in the tables of section 3.0 are calculated for costs in Toronto in 1982. The following table indicates the cost variation for cities across Canada. with Toronto base 100 %.*

	% VARIATION
Vancouver, British Columbia	105%
Edmonton, Alberta	110%
Calgary, Alberta	110%
Regina, Saskatchewan	108%
Saskatoon, Saskatchewan	109%
Winnipeg, Manitoba	99%
Toronto, Ontario	100%
Ottawa, Ontario	98%
Montreal, P.Q.	99%
Quebec City, P.Q.	102%
Saint John, New Brunswick	106%
Halifax, Nova Scotia	100%
St.John's, Newfoundland	118%

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* David K. Lansdowne and Partners: Lansdowne's Construction Cost Handbook, 1983, London, Ontario.